

# SEE4216: COMBUSTION AND AIR POLLUTION CONTROL

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## Effective Term

Semester A 2024/25

## Part I Course Overview

### Course Title

Combustion and Air Pollution Control

### Subject Code

SEE - School of Energy and Environment

### Course Number

4216

### Academic Unit

School of Energy and Environment (E2)

### College/School

School of Energy and Environment (E2)

### Course Duration

One Semester

### Credit Units

3

### Level

B1, B2, B3, B4 - Bachelor's Degree

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

PHY1201 General Physics I; AND  
SEE2101 Engineering Thermofluids I; AND  
SEE3101 Engineering Thermofluids II

### Precursors

CHEM2004 Principles of Analytical Chemistry; AND  
SEE3203 Air Pollution

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

The course is designed for the senior undergraduate students to understand the basics of air pollution control approaches and technologies. The course will provide the students with the fundamental knowledge of the air pollution sources and properties, the currently available air pollution control technologies and devices, including the theory behind the control methods, their design and efficiency analysis, as well as their applications.

### Course Intended Learning Outcomes (CILOs)

| CILOs |  | Weighting (if app.) | DEC-A1 | DEC-A2 | DEC-A3 |
|-------|--|---------------------|--------|--------|--------|
| 1     | Explain the fundamentals of combustion and air pollution generation  | 20                  |        | x      |        |
| 2     | Describe the operational principles of air pollution control devices and discover their respective application     | 30                  | x      | x      |        |
| 3     | Apply the knowledge innovatively in the calculation, design and engineering of the air pollution control processes | 50                  |        | x      | x      |

#### A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

#### A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

#### A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

### Learning and Teaching Activities (LTAs)

| LTAs | Brief Description | CILO No.   | Hours/week (if applicable) |
|------|-------------------|--|----------------------------|
| 1    | Lectures          | Students will learn the fundamental of combustion and air pollution and the operational principles of air pollution control devices and their practical design considerations for different application. | 1, 2, 3                    |
| 2    | Tutorials         | Students will develop understanding of key concepts and principles via practice and tackling difficulties encountered in the lectures and exercises.   | 1, 2, 3                    |

**Assessment Tasks / Activities (ATs)**

|   | ATs  | CILO No. | Weighting (%) | Remarks (e.g. Parameter for GenAI use) |
|---|--|----------|---------------|--|
| 1 | Assignments<br>Three assignments will be given throughout the semester. Students will complete the assignments to demonstrate their understanding fundamentals of combustion and air pollution, the operational principles of air pollution control devices, and their practical design considerations for different applications. | 1, 2, 3  | 40            |  |

**Continuous Assessment (%)**

40

**Examination (%)**

60

**Examination Duration (Hours)**

2

**Additional Information for ATs**

Final exam will test students' comprehensive understanding of fundamentals of combustion and air pollution, the operational principles of air pollution control devices, and their practical design considerations for different applications.

Examination duration: 2 hrs

Percentage of continuous assessment, examination, etc.: 40% by continuous assessment; 60% by exam

To pass a course, a student must do ALL of the following:

- obtain at least 30% of the total marks allocated towards continuous assessment (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
- obtain at least 30% of the total marks allocated towards final examination (if applicable); and
- meet the criteria listed in the section on Assessment Rubrics.

**Assessment Rubrics (AR)****Assessment Task**

1. Assignments

**Criterion**

Ability to explain the fundamentals of combustion and air pollution and provide control solutions to air pollution due to combustion processes

**Excellent (A+, A, A-)**

Excellent understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Good (B+, B, B-)**

Good understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Fair (C+, C, C-)**

Acceptable understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Marginal (D)**

Marginally acceptable understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Failure (F)**

Poor understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

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**Assessment Task**

2. Examination

**Criterion**

Ability to explain the fundamentals of combustion and air pollution and provide control solutions to air pollution due to combustion processes

**Excellent (A+, A, A-)**

Excellent understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Good (B+, B, B-)**

Good understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Fair (C+, C, C-)**

Acceptable understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Marginal (D)**

Marginally acceptable understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

**Failure (F)**

Poor understanding of fundamentals of combustion and air pollution and ability to provide air pollution control solutions

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## Part III Other Information

**Keyword Syllabus**

- a. Introduction to air pollution
- b. Basics of gas combustion
- c. Combustion process and air emissions formation
- d. Air pollution control approaches
  - i. Pre-combustion control
  - ii. In-combustion control
  - iii. Post-combustion control
- e. Key air pollution control technologies

**Reading List**

**Compulsory Readings**

| Title |     |
|-------|-----|
| 1     | Nil |

**Additional Readings**

| Title |   |
|-------|---|
| 1     | Zhongchao Tan, Air Pollution and Greenhouse Gases from Basic Concepts to Engineering Applications for Air Emission Control Springer Science+Business Media Singapore, 2014. ISBN: 978-981-287-211-1 |
| 2     | David Cooper, F. C. Alley Air Pollution Control (3rd Edition), Waveland Press, 2002. ISBN: 978-1577662181   |
| 3     | Kenneth W. Ragland & Kenneth M. Bryden, Combustion Engineering, 2nd ed. Boca Raton, FL : CRC Press, c2011, ISBN: 9781420092509  |